REMARKS

The piezoelectric ceramic compositions of the present invention have an improved flexural strength that is achieved without degrading heat resisting properties. In illustrative examples, it is now possible to obtain heat resisting properties such that the absolute value $|\Delta F_0|$ of the rate of change in oscillation frequency F_0 before and after application of a thermal shock is 0.10% or less. And at the same time, the three-point flexural strength σ_{b3} is 160 N/mm^2 or greater.

The matters raised in the Office action are discussed below in the same order as presented by the Examiner. Initially, the claim amendments are summarized as follows.

- Claim 1 is amended to change the upper limit of α to less than 1.00. This amendment is supported by the disclosure in the fourth full paragraph at page 9 of the specification providing: "The range of α is preferably $0.98 \leq \alpha < 1.00$, and more preferably $0.97 \leq \alpha < 1.00$."
- Claim 8 is amended to delete Ta and Sc from the additive group.
- Claim 15 is amended to delete Ta and Sc from the additive group.

It is requested that the Examiner reconsider and withdraw the rejection of claims 1, 4-6 and 7 under 35 USC 103(a)as being unpatentable over Ise in his publication "High Power Characteristics of Piezoelectric Ceramics in $Pb(Mn_{1/3}Nb_{2/3})O_3$-$PbTiO_3$-$PbZrO_3$ System" ("Ise") in view of Tajima in his publication "Electric-Field Induced Crack Growth Behavior in PZT/ Al_2O_3 Composites" ("Tajima"). Claim 1 has been amended to set the upper limit of α to less than 1.00 in order to distinguish over Ise. Ise only discloses the composition wherein α is fixed at 1. Accordingly, Ise fails to disclose the main component of the composition of amended claim 1.

Tajima does not remedy the above deficiency of Ise, and also fails to disclose the main component composition. Thus, amended claim 1 is distinguished over the teachings of Ise and Tajimi, alone or in combination.

As shown in Figs. 4, 6 and 7 of the application, all of the samples satisfying the main component composition and the Al_2O_3 amount as set forth in claim 1 achieve satisfactory heat resisting properties, electric properties and mechanical strength. Amended claim 1 therefore defines a limited group of compositions that have each of the improved properties of the claimed invention. There is no suggestion

in the art to provide the compositions as now set forth in claim 1.

The rejection of claims 1 and 8-20 under 35 USC 103(a) as unpatentable over Taiji JP2001-181033 ("Taiji") is in error and, in any event, overcome by amendment. As discussed below, the Taiji teachings fail to support a *prima facie* case of obviousness.

Taiji broadly discloses compositions having the generic formula $[Pb_{a1}A_{a2}][(B1B2)_xTi_yZr_z]O_3$. However, the four Taiji examples only disclose the following main components.

Example 1: $(Pb_xSr_{0.040})[Ti_{0.458}Zr_{0.532}(Co_{1/3}Nb_{2/3})_{0.010}]O_3$

Example 2: $(Pb_x)[Ti_{0.420}Zr_{0.480}(Zn_{1/3}Nb_{2/3})_{0.100}]O_3$

Example 3: $(Pb_xSr_{0.040})[Ti_{0.400}Zr_{0.335}(Mg_{1/3}Nb_{2/3})_{0.265}]O_3$

Example 4: $(Pb_xSr_{0.040})[Ti_{0.460}Zr_{0.460}(Sn_{1/2}Sb_{1/2})_{0.080}]O_3$

Accordingly, Taiji fails to disclose the composition of the main component of claim 1 as defined by the formula $Pb_\alpha[(Mn_{1/3}Nb_{2/3})_xTi_yZr_z]O_3$. Further, although the specific examples in Taiji include Ti and Zr, the ranges of Ti and/or Zr are different from those set forth in claim 1.

With specific reference to claim 1, Taiji fails to disclose any specific example wherein Al_2O_3 is added. As to claims 8-20, Taiji does not disclose Ga or In.

It is respectfully submitted that the Taiji disclosure of $[Pb_{a1}A_{a2}][(B1B2)_xTi_yZr_z]O_3$ is not sufficient to suggest the

compositions of claim 1 since the genus of compositions embraced by the Taiji generic formula obscures the claimed main component. In connection with the generic formula $[Pb_{a1}A_{a2}][(B1B2)_xTi_yZr_z]O_3$, Taiji teaches four component variables that must be initially selected to provide a pertinent main component. Specifically, Taiji teaches an additional component A selected from 4 elements, or possibly omitted because a2 may be zero, and which therefore comprises 5 variations, 12 elements for B1, 5 elements for B2 and 37 additives. In a simple composition calculation based on only these four variations, the total number of main component formulations that must be initially screened to reach the main component as defined in claim 1 is 11,100 (5 x 12 x 5 x 37). In view of the large number of variations resulting from these four basic variations contained in the Taiji generic formula, one of ordinary skill in the art is not able to "at once envisage" the claimed main component within the generic formula as discussed in Section 2131.02 of the MPEP.

As further suggested in Section 2131.02 of the MPEP, if one skilled in the art looks to the preferred embodiments for guidance, the illustrated embodiments in Taiji teach away from the claimed invention. As noted above, three of the four main components include an additional A constituent

and there is no example corresponding with the claimed main component. Moreover, the "y" and "z" values generally differ from those of the claimed invention. With particular regard to Example 2 in Taiji, the "y" and "z" are outside those of the claimed invention.

Further, it is important to note that Taiji never illustrates the use of Al_2O_3 and thereby tends to further obscure any suggestion of the claimed invention. Again, it must be appreciated that 37 different additives are taught in Taiji and no suggestion is provided as to the importance of the claimed Al_2O_3 additive discovered by the present inventors.

For all of the foregoing reasons, claims 1, 4, 5 and 7 - 20 are in condition for allowance and such action is requested.

If there are any fees required by this Amendment, please charge the same to Deposit Account No. 16-0820, Order No. OBA-40858.

Respectfully requested,

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December 17, 2009